PyGAMMA:

A Python Interface To GAMMA

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ABSTRACT

A Python interface has been constructed for the GAMMA magnetic resonance simulation platform. Through utilization of the BOOST library and simple code additions we were able to export virtually the entire GAMMA package into Python. This effectively exports the full functionality of the platform into an interactive environment without sacrificing its object oriented nature or flexibilty. Herein we discuss the implementation and it advantages as well as demonstrate it use with several examples.

Key Words: GAMMA; Python, BOOST, simulations; numerical calculations

INTRODUCTION

The GAMMA magnetic simulation (MR) platform (*12*). Its versatility stems directly from its object oriented design. Users must have some knowledge and C++ programming and be able to

Furthermore, since programs built using GAMMA are compiled into standalone executables, changes made to program variables may demand a time consuming recompilation before the user can see the effects of said changes.

PYTHON AND GAMMA

EXAMPLES

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[1]

Fig. 1. Calculat

Equation [1] satisfactorily explains why the minima for the different values of *á* in Fig. 1 (a) to 40.7 ìm under the conditions employed, may not be a suitable measure of the thickness of the slice excited by a 90° pulse.

Corresponding simulations to those presented in Figures 3 and 4 were performed for sinc and cosine shaped pulses. Key features for all four pulse types are summarised in Table 1.

TABLE 1
Averaged features of the 2D plots of $A_{\mathbf{max}}$, A_{Δ} and A_{ratio} for t_{p} ? 10 ìs for rectangular (Fig. 3), Gaussian (Fig. 4), sinc and cosine shaped pulses

Feature	Pulse Shape			
	rectangular	Gaussian	sinc *b*	cosine

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a The errors given for A_{max} and A_Δ are based on calculations performed at 1° intervals. This was sufficient resolution to produce a variation in results for rectangular pulses, but not in results for the other pulse shapes studied.

b The results for sinc shaped pulses reflect the calculated echo shapes which have several local maxima and minima even at relatively small flip angles.

Experiments to test the calculated results were performed at $\Omega/2\pi$ = 111.5 MHz in an accurately calibrated STRAFI gradient of 12.091 ± 0.016 T/m (*13*) using a probe that can take samples up to 5 cm in more conventional STRAFI experiment using fb = 256,000 Hz. The A_{ratio} values measured experimentally for each component of the phantom at specific tp values close to 90 degrees, 120 degrees, 135 degrees and 180 degrees are summarised in Table 2.

DISCUSSION

The calculated A_{max} values in Figures 3 and 4 show that the maximum echo amplitude for rectangular and lobe of the sinc excitation envelope. It is evident that the sample outside of this range makes a significant contribution to echo amplitude.

CONCLUSIONS

It is now possible to calibrate pulses for STRAFI echo trains accurately to within 1% in a simple. The GAMMA platform includes relaxation treatments and their use in STRAFI echo train calculations are now under investigation.

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